ZOOLOGY.—*A revision of the nomenclature of the Gorgoniidae (Coelenterata: Octocorallia), with an illustrated key to the genera.* Frederick M. Bayer, U. S. National Museum.

A superficial inquiry into the nomenclature of the Gorgoniidae was sufficient to reveal a state of confusion in the systematics of that family. Thorough search was therefore begun in order to discover the origin of this confusion and means of its clarification. Apparently, the principal source of error has been the acceptance of incorrect genotypes, without considering the earliest valid designations.

The latest revision of the Gorgoniidae was undertaken by Miss Eva Bielschowsky, a student of the noted zoophytologist Willy Kükenthal. Her preliminary study, prepared as a doctoral dissertation, was published in 1918; considerably expanded, it appeared again in 1929. In these works, Miss Bielschowsky unfortunately overlooked the early type designations of Milne Edwards and Haime and A. E. Verrill. These oversights were in some cases of little consequence, but the correction of two of them will greatly affect modern concepts of gorgoniid nomenclature.

The classification proposed in Miss Bielschowsky's thesis has been accepted without question in late years, and the incorrect name combinations used therein have become familiar. However, I feel that asking for a suspension of the International Rules of Zoological Nomenclature to preserve these combinations resulting from superficial research is not warranted by the limited zoological interest and importance of the gorgoniids.

The two changes necessary are the suppression of *Rhipidigorgia* Valenciennes, 1855, as a synonym of *Gorgonia* Linné, 1758, the genotype of both being *Gorgonia flabellum* Linné; and of *Xiphigorgia* Milne Edwards and Haime, 1857, as a synonym of *Pterogorgia* Ehrenberg, 1834, the genotype of both being *Gorgonia anceps* Pallas.

The disappearance of the name *Rhipidigorgia* could have been prevented had Miss Bielschowsky taken the proper precautions in her revision. Furthermore, the name *Xiphigorgia* could have been synonymized before it had an opportunity to become well established in the modern literature.

To summarize the history of this confusion: Linné's genus *Gorgonia*, 1758, was a heterogeneous collection of nine species: *G. spiralis, ventalina, flabellum, antipathes, ceratophyta, pinnata, aenea, placomus*, and *abies*. Of these, three (*spiralis, aenea*, and *abies*) are antipatharians and do not concern us here; one (*antipathes*) is a plexaurid and one (*placomus*) a muriceid, and were removed from *Gorgonia* by Lamouroux and Ehrenberg respectively. In 1834, Ehrenberg created *Pterogorgia* for eight species including *Gorgonia acerosa* Pallas, *G. fasciolaris* Esper (var. of *citrina*) and *G. anceps* Pallas. In 1850, Milne Edwards and Haime designated *G. anceps* as the type of *Pterogorgia*. In 1855, Valenciennes proposed the genus *Rhipidigorgia* for those species with anastomosing branches, but failed to designate a type species. Then, in 1857, Milne Edwards and Haime established *Xiphigorgia* for one species with trialate and another with whiplike branches, *Gorgonia anceps* Pallas and *G. setacea* Pallas, the first of which they had already selected as the type of *Pterogorgia*. At the same time these authors erected *Leptogorgia* for several species of slender-branched gorgoniids, but, as in *Xiphigorgia*, failed to indicate a type species. Prof. A. E. Verrill in 1868 established without a type species the genus *Litigorgia* for several species of gorgoniids including two with anastomosing branches and five with free branches. In a later paper in the same year, he designated *G. flabellum* Linné as the type of *Gorgonia*, *G. acerosa* Pallas as the type of *Pterogorgia* (overlooking Milne Edwards and Haime's selection of *G. anceps* as the type of that genus), *L. florae* Verrill as the type of *Litigorgia*, and *Gorgonia viminalis* Pallas *sensu* Milne Edwards and Haime as the type of *Leptogorgia*. A status quo obtained until 1918, when Miss Bielschowsky stated in her revision that *G. flabellum* was the type of *Rhipidigorgia*, thereby making it an absolute synonym of *Gorgonia*. Had she realized that Verrill already had used that species as the type of *Gorgonia*, she might have preserved *Rhipidigorgia* by a judicious choice of genotype species.

GORGONIIDAE

Diagnosis.—Holaxonians with branching usually in one plane, lateral or pinnate, alternate or opposite; anastomosis of the twigs present or absent. Zooids usually infrequent or absent at the base of colony, and ordinarily occurring in two lateral rows along stems and branches; low verrucae present or absent. Anthocodial armature usually a weak crown of small, more or less flattened rods or spindles which are either warted or practically smooth. Spicules of the coenenchyma are spindles with regular transverse belts of warts, reaching 0.3 mm in length; spindles

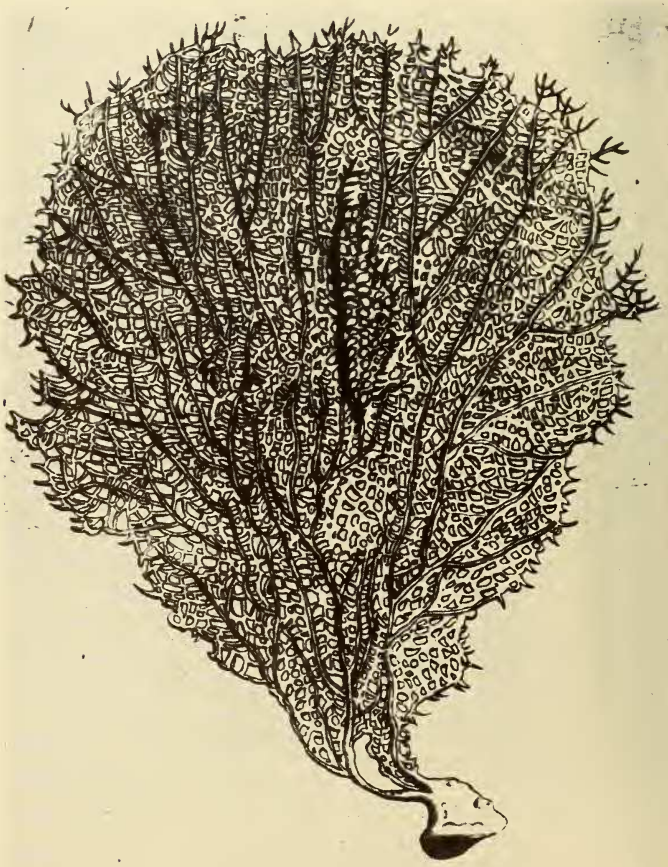


FIG. 1.—*Gorgonia flabellum* Linné. Copied from B. Cerutus, *Musaevm Franc. Calceolari Ivn. Veronensis:* 16, 1622. This is probably the best post-Renaissance illustration of this well-known animal.

with the warts fused to form disks, and peculiar bent spindles (scaphoids) occur in certain genera. Axis horny, with little or no loculation of the cortex.

Remarks.—The genus *Swiftia* Duchassaing and Michelotti, 1860 (monotype *Gorgonia exserta* Ellis and Solander) [=*Stenogorgia* Verrill, 1888 (*S. casta* Verrill) =*Callistephanus* Wright and Studer (*C. koreni* Wright and Studer)] should be transferred to the family Muriceidae.

Genus **Gorgonia** Linné

Gorgonia (part) Linné, 1758, Syst. Nat., ed. 10, **1:** 800. [Type *G. flabellum* L., subs. des. Verrill, 1868, Trans. Connecticut Acad. **1:** 386.]

not *Gorgonia* Bielschowsky, 1918, Revis. Gorg.: 32; Kükenthal, 1919, Wiss. Ergeb. deutschen Tiefsee-Exped. **13** (2): 852; Kükenthal, 1924, Das Tierreich **47:** 338; Deichmann, 1936, Mem. Mus. Comp. Zool. **53:** 174.

Rhipidigorgia (part) Valenciennes, 1855, C. R. Acad. Sci. Paris **41:** 13. [Type, *G. flabellum* L., subs. des. Bielschowsky, 1918, Revis. Gorg.: 49.]

Rhipidogorgia [sic] Duchassaing and Michelotti, 1860, Mém. corall. Antill.: 33; Kükenthal, 1916, Zool. Jahrb., Suppl. 11: 485; Bielschowsky, 1918, Revis. Gorg.: 49; Kükenthal, 1919, Wiss. Ergeb. deutschen Tiefsee-Exped. **13** (2): 853; Kükenthal, 1924, Das Tierreich **47:** 350; Deichmann, 1936, Mem. Mus. Comp. Zool. **53:** 192.

Diagnosis.—Colonies with branching in one plane developed as one or more flat fans; twigs closely anastomosed to form a regular network. Zooids in two lateral rows on the twigs, either with very low verrucae or retracting flush with the coenenchyma surface; anthocodial armature of weakly sculptured rods. Coenenchyma spicules as girdled spindles and stout scaphoids.

Genotype.—*Gorgonia flabellum* Linné, 1758 (subsequent designation: A. E. Verrill, 1868, Trans. Connecticut Acad. **1:** 386).

Gorgonia flabellum Linné
Fig. 1

Frutex marinus elegantissimus Clusius, 1605, Exoticorvm: 120 fig.

Planta marina retiformis Olearius, 1674, Gottorf. Kunst-Kamm.: 69, pl. 35, fig. 2.

Planta retiformis maxima + *Frutex marinus major* Lochner, 1716, Rar. mus. Besl.: 78, 79, pl. 24.

Flabellum Veneris Ellis, 1755, Essay nat. hist. corallines: 61, pl. 26, fig. K.

Gorgonia flabellum Linné, 1758, Syst. Nat., ed. 10, **1:** 801; Esper, 1791, Pflanzenthiere **2:** 23, pls. 2–3a; Verrill, 1869, Amer. Journ. Sci. **48:** 424; Hargitt and Rogers, 1901, Bull. U. S. Fish. Comm. **20** (2): 287, pl. 3, fig. 3.

Rhipidigorgia flabellum Valenciennes, 1855, C. R. Acad. Sci. Paris **41:** 13.

Rhipidogorgia [sic] *flabellum* Duchassaing and Michelotti, 1860, Mém. corall. Antill.: 33; Kükenthal, 1916, Zool. Jahrb., Supp. 11: 485; Kükenthal, 1924, Das Tierreich **47:** 350, fig. 180; Bielschowsky, 1929, Zool. Jahrb., Supp. 16: 194.

The name by which this species was known for many years is hereby restored. *Gorgonia flabellum* was among the first objects of curiosity brought back from the New World, and published records of it date back well over 300 years. The accompanying illustration of it, perfectly recognizable, was published in 1622.

Valenciennes' genus *Rhipidigorgia* was originally proposed to include all gorgonians with anastomosing branches. The characters used for generic distinction in the time of Valenciennes were necessarily the gross morphological features which could be observed without complex optical devices. The importance of the calcareous spicules had not even been guessed, and as a result it can now be recognized that the original concept of *Rhipidigorgia* included at least three genera as distinguished by modern methods. The three groups of species include (1) *Rhidipigorgia umbraculum* [now in *Gorgonella*]; (2) *R. stenobrochis, arenata* and *cribrum* [usually placed in *Gorgonia*]; and (3) *R. flabellum, coarctata* and *occatoria* [considered to be *Rhidipigorgia* s.s.]. An eighth species, *R. laqueus* Valenciennes (a *nomen nudum*), is still unrecognizable even as to genus, although according to Milne Edwards and Haime (1857) it may be *Gorgonia sasappo* var. *reticulata* Esper (=*Echinogorgia pseudo-sasappo* Kölliker). Verrill in 1864 shifted *R. umbraculum* to the genus *Gorgonella*, and in 1868 made *R. flabellum* (L.) the type of the original Linnaean *Gorgonia*. This procedure left *Rhipidigorgia* with only three species, *R. stenobrochis, arenata* and *cribrum*. When Bielschowsky in 1918, apparently unaware of Verrill's earlier action, considered *R. flabellum* as the type species of *Rhipidigorgia*, she restricted the generic concept to include only those forms with reticulating branches and scaphoid spicules and made it synonymous with the Linnaean *Gorgonia* as restricted by Verrill. Valenciennes' remaining species, *R. stenobrochis, arenata* and *cribrum* have therefore been excluded from all described gorgoniid genera. Although *R. stenobrochis* at various times has been placed in *Leptogorgia, Litigorgia* and *Eugorgia*, those genera as limited by the designation of their type species cannot include these three orphan species and the related forms subsequently described by Verrill and Hickson.

These reticulate gorgoniids lacking scaphoid spicules therefore require a new genus, for which the name *Pacifigorgia* is here proposed.

Pacifigorgia, n. gen.

Rhipidigorgia (part) Valenciennes, 1855, C. R. Acad. Sci. Paris **41:** 13; Verrill, 1864, Bull. Mus. Comp. Zool. **1:** 32 (part).

Litigorgia (part) + *Eugorgia* (part) Verrill, 1868, Amer. Journ. Sci. **45:** 414.

Leptogorgia (part) Verrill, 1869, Amer. Journ. Sci. **48:** 420.

Gorgonia Bielschowsky, 1918, Revis. Gorg.: 32; Kükenthal, 1919, Wiss. Ergeb. deutschen Tiefsee-Exped. **13** (2): 852; Kükenthal, 1924, Das Tierreich **47:** 338; Bielschowsky, 1929, Zool. Jahrb. Supp. 16: 141; Deichmann, 1936, Mem. Mus. Comp. Zool. **53:** 174.

Diagnosis.—Colony flabellate, branched in one plane; the twigs regularly anastomosing to form a close network. Zooids retracting within low verrucae or flush with the surface of the coenenchyma; anthocodial armature of more or less flattened rods usually present. Spicules of the coenenchyma are girdled spindles, including: long, more or less pointed forms with several belts of warts; and short, blunt forms with only 2–4 belts of warts ("double heads").

Genotype.—*Gorgonia stenobrochis* Valenciennes =*Pacifigorgia stenobrochis* (Val.), n. comb., here designated.

Remarks.—This genus includes all those reticulate forms from the west coast of Central and South America previously known as *Gorgonia*. Except for one species from Trinidad and Brazil (*P. elegans* (Duch. & Mich.) =*Gorgonia hartti* Verrill), *Pacifigorgia* is confined to the eastern Pacific, from the Gulf of California to Peru. The generic name is chosen to indicate this predominantly Pacific distribution of the genus.

Pacifigorgia irene, n. sp.
Figs. 2, 3

Leptogorgia adamsii (part) Verrill, 1868, Trans. Connecticut Acad. **1:** 391.

Gorgonia media? Bielschowsky, 1918, Revis. Gorg.: 38; 1929, Zool. Jahrb., Supp. 16: 147.

Gorgonia media Galtsoff, 1950, Special Sci. Rep. U. S. Fish and Wildlife Serv. 28: 27.

Diagnosis.—The colonies form large, broad, finely reticulate fans crossed by several very stout main branches which can be followed to within 2 or 3 cm of the free edge. Zooids occur chiefly along the outer edges of the anastomosed twigs, and are retractile within small, often bilabiate verrucae. Spicules of the coencenhyma are long, pointed spindles 0.1–0.13 mm long, and short, blunt "double heads" up to 0.075 mm long; these sclerites are red, yellow or colorless. Anthocodial armature a weak crown of flat "rods" with broadly scalloped edges, reaching

FIG. 2.—*Pacifigorgia irene*, n. gen., n. sp. The holotype, about one-fourth natural size.

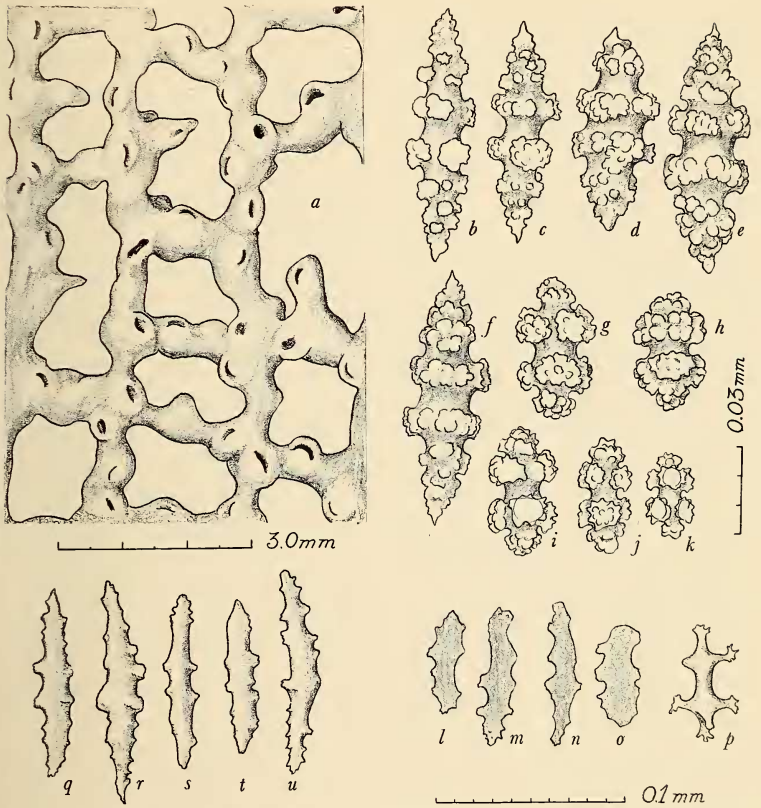


Fig. 3.—*a–p*, *Pacifigorgia irene*, n.gen., n.sp.: *a*, Detail of branching; *b–f*, long spindles; *g–k*, short spindles or "double heads"; *l–o*, flat, anthocodial sclerites; *p*, small capstan from anthocodia. *q–u*, *Pacifigorgia adamsi* (Verrill): Anthocodial sclerites. 3.0-mm scale applies to *a* only; 0.03-mm scale to *p* only; 0.1-mm scale to all others.

0.05 mm in length, and small, spindly capstans about 0.04 mm long; these spicules are usually colorless, but a few may be tinted pink. Color of colony rusty purplish red.

Description.—The type is a broad, flat fan about 35 cm high and 63 cm broad. (A part of the colony has been cut away, and its total width probably exceeded 70 cm.) The twigs are very slender, closely and regularly anastomosed to form a network of small, squarish meshes 1.5–2.0 mm in diameter. Several stout main branches flattened in the plane of ramification arise from the base and radiate outward across the fan, branching occasionally and diminishing in diameter slowly, losing themselves in the meshwork only 2 or 3 cm from the edge of the colony. Zooids do not occur on the flat outer faces of the midribs, but are found in a row along the line where the twigs are given off on either side. The anastomosing twigs are flattened at right

angles to the plane of the fan, and along their outer edges the zooids form small, hemispherical, often bilabiate verrucae; two zooids usually occur on the tips of the free, unanastomosed twig ends, which are up to 5 mm in length. The color of the colony is a rusty purplish red, fading to an ochre yellow in some places along the edge of the fan.

The spicules of the coenenchyma are of two types: (1) long, pointed spindles with a prominent naked girdle and 4–6 belts of warts, reaching 0.13 mm in length; and (2) short, blunt spindles or "double heads" also with a median naked space, but with only two belts of warts and terminal tufts, reaching about 0.075 mm. The coenenchyma spicules are usually red, but a few are colorless. In the yellow areas of the colony they are mostly pale yellow. The spicules of the anthocodia are flat rods with widely scalloped margins, reaching about 0.05 mm in length. These spicules are almost always colorless, but a few may be tinted with pink. There are also a few weak, long-armed capstans, which are colorless.

Holotype.—U.S.N.M. no. 49365. Punta Pajaron, Panama, lat. 7° 55′ N., long. 81° 38′ W.; March 11, 1948, Paul S. Galtsoff, collector.

Records.—Golfo de Nicoya, Costa Rica; March 1927, M. Valerio, collector (49379); Costa Rica no definite locality (33611).

Remarks.—*Pacifigorgia irene* is perfectly distinct from *P. adamsii* (Verrill), with which it was originally included. Verrill's remarks about "adult specimens" (1868, Trans. Connecticut Acad. **1:** 391) refer to this species. The several specimens of *P. adamsii* in the Museum of Comparative Zoology and those in the U. S. National Museum are uniformly small colonies, as are a number of the original specimens in Verrill's collection in the Peabody Museum at Yale University. Unfortunately, the latter have not been available for spicular examination, but all are of such uniform outer appearance that I have no hesitancy in considering them the same. The mesh of P. *adamsii* is about the same as that of the new species, but it lacks any trace of strong midribs, and the color is purple or yellow rather than the rusty purplish red characteristic of *P. irene*. In addition, the anthocodial spicules of the two species are distinct. Those of *P. irene* are flat, broad, and almost always colorless; those of *P. adamsii* are round or but little flattened, slender, longer than those of *P. irene*, and almost always clear, pale yellow. Figures of the anthocodial spicules from both species are given in order to make the differences clear. The coenenchymal spicules differ less, but seem to be a little longer in *P. adamsii*.

The specific name is chosen from the Greek word εἰρήνη, peace, in keeping with the derivation of the generic term *Pacifigorgia*.

Genus **Pterogorgia** Ehrenberg

Gorgonia (part) Pallas, 1766, Elench. Zooph.: 160.
Pterogorgia (part) Ehrenberg, 1834, Abh. Königl. Akad. Wiss. Berlin 1832 (pt. 1): 368. [Type *G. anceps* Pallas, subs. des.: Milne Edwards and Haime, 1850, Brit. Foss. Corals: lxxx.]
Xiphigorgia (part) Milne Edwards and Haime, 1857, Hist. nat. corall. **1:** 171; Kükenthal, 1916, Zool. Jahrb., Suppl. 11: 491 (part); Bielschowsky, 1918, Revis. Gorg.: 62; Kükenthal, 1924, Das Tierreich **47:** 357 (part); Deichmann, 1936, Mem. Mus. Comp. Zool. **53:** 200. [Type, *G. anceps* Pallas, subs. des.: Bielschowsky, 1918, Revis. Gorg.: 62.]

Diagnosis.—Colonies more or less richly branched, mostly laterally; branches strongly compressed, triangular, or square; zooids in longitudinal furrows on the edges of rather high, thin coenenchymal ridges running along two, three or four sides of the stems and branches. Zooids small; anthocodial armature a weak crown consisting of 8 tracts of flattened rods. Coenenchyma with stout, strongly warted spindles and blunt scaphoids.

Genotype.—*Gorgonia anceps* Pallas (by subsequent designation: Milne Edwards and Haime, 1850, Brit. Foss. Corals: lxxx).

Remarks.—This genus includes three certain and one doubtful species, all Antillean. The valid species are:

Pterogorgia anceps (Pallas)

Corallina fruticosa, ramulis & caulículis compressis, quaquaversum expansis, purpureis elegantissimis Sloane, 1707, Voyage to Jamaica: 57, pl. 22, fig. 4.
Gorgonia anceps Pallas, 1766, Elench. Zooph.: 183; Verrill, 1869, Amer. Journ. Sci. **48:** 425.
Pterogorgia anceps Ehrenberg, 1834, Abh. Königl. Akad. Wiss. Berlin 1832 (pt. 1): 369.
Gorgonia (Pterogorgia) anceps Dana, 1846, U. S. Expl. Exped. **7:** 648.
Xiphigorgia onceps Milne Edwards and Haime, 1857, Hist. nat. corall. **1:** 172; Kükenthal, 1924, Das Tierreich **47:** 357 (part); Deichmann, 1936, Mem. Mus. Comp. Zool. **53:** 201.

This is the common, large, purple or yellowish species with branches square or triangular in cross section. Its branches are never so broad and flat as in *P. guadalupensis* Duchassaing and Michelin.

Pterogorgia citrina (Esper)

Gorgonia citrina Esper, 1792, Pflanzenthiere **2:** 129, pl. 38; Verrill, 1869, Amer. Journ. Sci. **48:** 425.

Pterogorgia fasciolaris + *P. Sancti Thomae* Ehrenberg, 1834, Abh. Königl. Akad. Wiss. Berlin 1832 (pt. 1): 369.

Gorgonia (*Pterogorgia*) *citrina* Dana, 1846, U. S. Expl. Exped. **7:** 648.

Pterogorgia citrina Duchassaing and Michelotti, 1860, Mém. corall. Antill.: 30.

Xiphigorgia citrina Verrill, 1864, Bull. Mus. Comp. Zool. **1:** 33; Kükenthal, 1924, Das Tierreich **47:** 358, fig. 182; Deichmann, 1936, Mem. Mus. Comp. Zool. **53:** 201.

This is the familiar, small *Pterogorgia* with flat branches, usually yellow with purple edges, sometimes all purple.

Pterogorgia guadalupensis Duchassaing and Michelin

Pterogorgia guadalupensis Duchassaing and Michelin, 1846, Rev. Zool. Soc. Cuvierienne **9:** 218.

Xiphigorgia guadalupensis Duchassaing and Michelotti, 1860, Mém. corall. Antill.: 33.

Gorgonia guadalupensis Verrill, 1869, Amer. Journ. Sci. **48:** p. 425.

Xiphigorgia anceps (part) Kükenthal, 1924, Das Tierreich **47:** 357.

Specimens collected in the Gulf of Mexico during the first and second University of Miami Marine Laboratory Gulf of Mexico Sponge Investigations 1947 and 1948, by Dr. F. G. Walton Smith and J. Q. Tierney, have convinced me that Duchassaing and Michelin's species is perfectly distinct and worthy of recognition. I have been unable to find specimens of *P. anceps* which grade into it, either in the large series in the U. S. National Museum or among specimens in the field. A complete redescription will be published at a later date.

The specimens of *P. guadalupensis* examined agree perfectly with Duchassaing and Michelotti's figure. The species is readily distinguished from *P. anceps* by its very much broader, flat branches which are never trialate. Part of a specimen is shown in the accompanying key-figure 9, compared with *P. anceps*.

A situation similar to that involving *Gorgonia* and *Rhipidigorgia* exists between *Pterogorgia* Ehrenberg and *Xiphigorgia* Milne Edwards and Haime. In short, the genus *Pterogorgia* of Ehrenberg, like many other early genera, was a polyphyletic assemblage, and its species can now be divided into at least two modern genera, apportioned as follows: (1) *P. setosa* Esper, *acerosa* [Pallas?] Ehrenberg, *stricta* Ehrenberg, *turgida* Ehrenberg; and (2) *P. fasciolaris* Ehrenberg (=*citrina* Esper, var.?), *sancti-thomae* Ehrenberg (?=*citrina* Esper), *anceps* Pallas, and *violacea* Ehrenberg non Pallas [?=*anceps*]. Ehrenberg also assigned questionably *Gorgonia americana* Gmelin, *sanguinolenta* Pallas [both *fide* Cuvier], and *pinnata* L. [*fide* Gmelin] to his *Pterogorgia*, without having seen specimens. Milne Edwards and Haime in 1850 designated *P. anceps* (Pallas) as the type species of *Pterogorgia*, thereby restricting the genus to the second group mentioned above. Completely disregarding the restriction which they themselves had imposed, these authors created in 1857 a new genus, *Xiphigorgia*, which included *Gorgonia anceps*, and this usage became generally accepted. This was undoubtedly due in no small part to the fact that the latter arrangement was proposed in their well-known *Histoire naturelle des coralliaires*, whereas the earlier restriction of *Pterogorgia* was made in the introduction to their *Monograph of the British fossil corals*, a work holding little interest to the student of recent Gorgonacea. Consequently, Verrill overlooked the delimitation of *Pterogorgia* and proposed *P. acerosa* (Pallas) as the type species of Ehrenberg's genus; this procedure, which applied the name *Pterogorgia* to the first of the two groups mentioned above, subsequently came into general acceptance. The generic limits of *Xiphigorgia* were established by Miss Bielschowsky when she designated (1918) *X. anceps* as its type, but she failed to perceive that it was then absolutely synonymous with *Pterogorgia* s.s. and that half of the original *Pterogorgia* species were not referable to any described genus. This situation has remained unchanged, and the species eliminated from *Pterogorgia* still require a genus to include them, for which I propose the name *Antillogorgia*.

Antillogorgia, n. gen.

Pterogorgia (part) Ehrenberg, 1834, Abh. Königl. Akad. Wiss. Berlin 1832 (pt. 1): 368; Milne Edwards and Haime, 1857, Hist. nat. corall. **1:** 167 (part); Bielschowsky, 1918, Revis. Gorg.: 52; Kükenthal, 1924, Das Tierreich **47:** 351; Bielschowsky, 1929, Zool. Jahrb., Suppl. 16: 197; Deichmann, 1936, Mem. Mus. Comp. Zool, **53:** 193.

Diagnosis.—Colonies mostly bushy, with the secondary branching in one plane; numerous

twigs arranged along the main branches in close pinnate order, sometimes with secondary twigs; stem and branches round or flattened; twigs round, or more frequently somewhat compressed. Zooids small, not producing verrucae, usually arranged in two rows along the edges of the twigs; they sometimes occur in rows on the large branches and main stems. Anthocodia either unarmed or with small, more or less flattened rods arranged in 8 triangles to form a weak crown. Coenenchyma spicules are scaphoids and spindles in the outer layer, spindles alone in the inner.

Genotype.—*Gorgonia acerosa* Pallas = *Antillogorgia acerosa* (Pallas), n. comb., here designated.

Remarks.—This genus is apparently confined to the Antillean region. Its species form one of the most conspicuous elements of the littoral marine fauna along the reefs of Florida and in the West Indies. The most abundant species, at least on the Florida coast, is *Antillogorgia acerosa* (Pallas). For a description, see Deichmann, 1936, Mem. Mus. Comp. Zool. **53:** 198. It is usually dark purple when alive. *A. ellisiana* (Milne Edwards and Haime) and *A. americana* (Gmelin) are not uncommon in the same regions. The living colonies are usually brownish purple.

Genus **Phyllogorgia** Milne Edwards and Haime

Gorgonia (part) Esper, 1791, Pflanzenthiere **2:** 1.
Gorgonia (*Pterogorgia*) (part) Dana, 1846, U. S. Expl. Exped. **7:** 647.
Phyllogorgia Milne Edwards and Haime, 1850, Brit. Foss. Corals: lxxx. [Type, *Gorgonia dilatata* Esper.]
Hymenogorgia Valenciennes, 1855, C. R. Acad. Sci. Paris **41:** 13. [Type, *Gorgonia quercus folium* Ehrenberg = *Gorgonia dilatata* Esper.]
Phyllogorgia Verrill, 1912, Journ. Acad. Nat. Sci. Philadelphia (2)**15:** 393.

Diagnosis.—Colonies branched in one plane, the branches forming broad, flat leaves; axis anastomosing. Zooids small, without verrucae, on all surfaces of the leaves. The spicules are stout spindles and scaphoids.

Genotype.—*Gorgonia dilatata* Esper (by original designation).

Remarks.—The single species, *P. dilatata*, is found on the coast of Brazil. The single early record of its occurrence at Guadeloupe has not been confirmed.

Genus **Leptogorgia** Milne Edwards and Haime

Gorgonia (part) Pallas, 1766, Elench. Zooph.: 160; Milne Edwards and Haime, 1857, Hist. nat. corall. **1:** 157 (part).
Leptogorgia (part) Milne Edwards and Haime, 1857, Hist. nat. corall. **1:** 163. [Type, *G. viminalis* Milne Edwards and Haime = *G. viminalis* Esper = *Leptogorgia longiramosa* Kükenthal 1924; subs. des.: Verrill, 1868, Trans. Connecticut Acad. **1:** 387.]
Lophogorgia (part) Milne Edwards and Haime, 1857, Hist. nat. corall. **1:** 167. [Type, *G. flammea* Ellis and Solander.]
Litigorgia (part) Verrill, 1868, Amer. Journ. Sci. **45:** 414. [Type, *L. florae* Verrill; subs. des.: Verrill, 1868, Trans. Connecticut Acad. **1:** 387.]
Eugorgia (part) Verrill, 1868, Amer. Journ. Sci. **45:** 414.
?*Pseudopterogorgia* Kükenthal, 1919, Wiss. Ergeb. deutschen Tiefsee-Exped. **13** (2): 854. [Type, *Leptogorgia australiensis* Ridley, 1884.]
Asperogorgia Stiasny, 1943, Vid. Medd. Dansk naturh. Foren. **107:** 92. [Type, *L. radula* (Möbius).]

Diagnosis.—Colonies mostly branched in one plane, lateral or pinnate, occasionally dichotomous, rarely bushy; branches and twigs somewhat flattened but never greatly expanded to form lamellar ridges. Zooids in two lateral tracts along the sides of twigs and branches, fully retractile or forming low verrucae; anthocodial armature of small rods or spindles usually present. Coenenchyma with girdled spindles but no modified forms.

Genotype.—*Gorgonia viminalis* Milne Edwards and Haime (by subsequent designation: Verrill, 1868, Trans. Connecticut Acad. **1:** 387).

Remarks.—Bielschowsky's designation of *G. petechizans* Pallas as the type of *Leptogorgia* could have no standing even if it had priority, since that species was not included within the genus as originally constituted.

Leptogorgia contains many species in temperate and tropical waters, and although it is represented practically around the world, the center of distribution seems to be in the neighborhood of the west coast of Central America.

The characters ordinarily used for separating *Lophogorgia* from *Leptogorgia*, the flattened branches and arrangement of zooids all around the branches and tiwgs, are so variable as to be useless for generic distinctions. Round as well as flattened branches may occur in the same colony, and the biserial zooid distribution can

be found with little difficulty, Furthermore, specimens of *Leptogorgia* which are typical in all other respects may have zooids distributed all around the twigs. The presence of distinct verrucae, the feature used by Stiasny to distinguish his *Asperogorgia* species from the other Lophogorgias (which he considered as part of *Leptogorgia*), is no more reliable. I have therefore placed both these genera in the synonymy of *Leptogorgia*.

Kükenthal's *Pseudopterogorgia* (1919) was created on the strength of some supposed "klammern" in four Indo-Pacific species. An examination of the original description and figures of the type species, *P. australiensis* (Ridley), suggests that Ridley's original generic assignment of the species (*Leptogorgia*) was correct. The spicules are all described as fusiform, and while one of the individuals figured is a little curved, it is not a very convincing scaphoid. I am therefore tentatively synonymizing the genus and referring its species back to *Leptogorgia*.

Genus **Phycogorgia** Milne Edwards and Haime

Gorgonia Valenciennes, 1846, Voyage of the *Venus*, Atlas of Zool., Zoophytes: pl. 11, fig. 2.
Phycogorgia Milne Edwards and Haime, 1850, Brit. Foss. Corals: lxxx. [Type, *Gorgonia fucata* Valenciennes.]
Phycogorgia Kükenthal, 1924, Das Tierreich **47:** 359.

Diagnosis.—Colonies bushy, the stems and branches strongly flattened and frondose, arising from a spreading base. Axis lamellar. Zooids small, completely retractile and without armature, on the fronds and on the base. Spicules are small, blunt, girdled spindles.

Genotype.—*Gorgonia fucata* Valenciennes, 1846 (by original designation).

Remarks.—Only one species is known, occurring in shallow water from Mazatlán to Chile.

Genus **Eugorgia** Verrill

Lophogorgia (part) G. Horn, 1860, Proc. Acad. Nat. Sci. Philadelphia **12:** 233.
Gorgonia (part) Verrill, 1864, Bull. Mus. Comp. Zool. **1:** 33.
Eugorgia (part) Verrill, 1868, Amer. Journ. Sci. **45:** 414. [Type, *E. ampla* Verrill; subs. des.: Verrill, 1868, Trans. Connecticut Acad. **1:** 386.]
Eugorgia Verrill, 1868, Trans. Connecticut Acad. 1: 406; Bielschowsky, 1929, Zool. Jahrb., Supp. 16: 170.

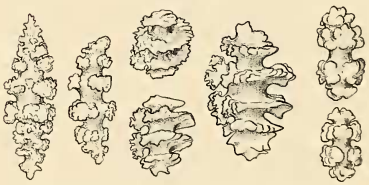
Diagnosis.—Branching chiefly in one plane, lateral or dichotomous, sometimes bushy. Zooids in biserial longitudinal rows, usually without anthocodial armature, with or without low verrucae. The spicules are ordinary spindles, together with disk spindles produced by the more or less complete fusion of the warts of the median 2 or 4 belts to form disks.

Genotype.—*Leptogorgia ampla* Verrill (by subsequent designation: Verrill, 1868, Trans. Connecticut Acad. **1:** 386).

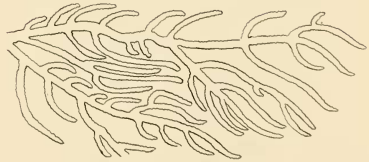
Remarks.—Although *Eugorgia* is now an exclusively west American genus, two Atlantic gorgoniids are apparently related to it. *Leptogorgia virgulata* Lamarck and *L. setacea* (Pallas) have spicules identical with the poorly developed disk spindles and intermediate forms to be found in a number of *Eugorgia* species. They may be relict species of a once widespread *Eugorgia*, or only Leptogorgias developing along *Eugorgia* lines. It remains for future study to determine which is actually the case.

ILLUSTRATED KEY TO THE GENERA OF THE FAMILY GORGONIIDAE

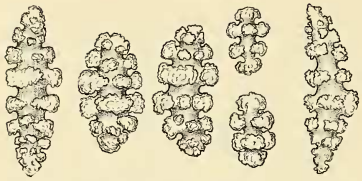
A[1]. Spicules as spindles of various forms, some of which may occasionally be slightly bent, but never as true scaphoids, or "half-moon"-shaped spicules:



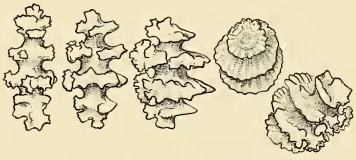
B[1]. Branches and twigs not coalescent, but free and usually slender:



C[1]. Spicules only regular spindles: LEPTOGORGIA.



C^2. Spicules include spindles with warts more or less completely fused to form disks: Eugorgia.



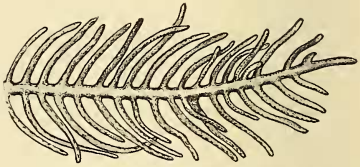
B^2. Branches and twigs coalescing to form a regular meshwork: Pacifigorgia.

B^3. Branches and twigs flat, foliate: Phycogorgia.

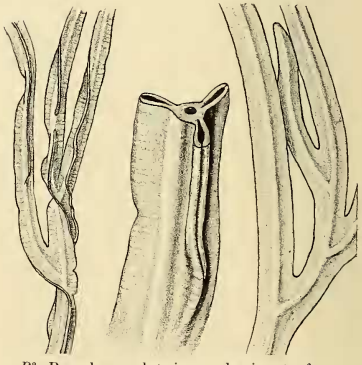
A^2. Scaphoid spicules present in addition to simple spindles:

B^1. Branches and twigs not coalescent, but free and usually slender:

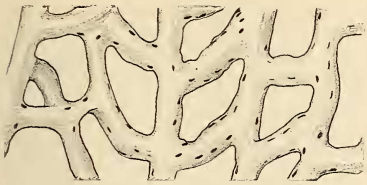
C^1. Branching closely pinnate, the twigs slender, round or only slightly compressed: Antillogorgia.



C^2. Branching not closely pinnate; branches and twigs with two, three, or four longitudinal, thin, coenenchymal lamellae, causing them to be flat and bladelike, triangular, or square in cross section: Pterogorgia.



B^2. Branches and twigs coalescing to form a regular network: Gorgonia.



B[3]. Branches and twigs flat, foliate: Phyllogorgia.

LITERATURE CITED

Bielschowsky, Eva. *Eine Revision der Familie Gorgoniidae.* Inaugural-Dissertation zur Erlangung der Doktorwürde der Hohen Philosophischen Fakultät der Schlesischen Friedrich-Wilhelms-Universität zu Breslau: 1–66. Breslau, 1918.

———. *Die Gorgonarien Westindiens. Kap. 6, Die Familie Gorgoniidae.* Zool. Jahrb., Suppl. 16, Heft 1: 63–234, 40 figs., pls. 2–5. 1929.

Clusius, Carolus. *Exoticorvm libri decem: quibus animalium, plantarum, aromatum, aliorumque peregrinorum fructuum historiae discribuntur:* [10] 1–378 [5], illus. Antverpiae, 1605.

Dana, James Dwight. *Zoophytes.* U. S. (Wilkes) Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842, **7:** i–vi + 1–740, 45 figs., atlas of 61 col. pls. 1846.

Deichmann, Elisabeth. *The Alcyonaria of the western part of the Atlantic Ocean.* Mem. Mus. Comp. Zoöl. **53:** 1–317, pls. 1–37. 1936.

Duchassaing de Fonbressin, Placide, and Michelin, Hardouin. *Note sur deux polypiers de la famille des coraux appartenant aux genres* Solanderia *et* Pterogorgia. Rev. Zool. Soc. Cuvierienne **9:** 218–220. 1846.

——— and Michelotti, Jean. *Mémoire sur les coralliaires des Antilles:* 1–88, pls. 1–10. Mem. Reale Accad. Sci. Torino, ser. 2, **19:** 279–365, pls. 1–10. 1860.

Ehrenberg, Christian Gottfried. *Beiträge zur physiologischen Kenntniss der Corallenthiere im allgemeinen, und besonders des rothen Meeres, nebst einem Versuche zur physiologischen Systematik de selben.* Abh. Königl. [preussischen] Akad. Wiss. Berlin 1832 (pt. 1): 225–380. 1834.

Ellis, John. *An essay towards the natural history of the corallines, and other marine productions of the like kind, commonly found on the coasts of Great Britain and Ireland:* i–xvii + [5 lvs] 1–103, pls. 1–37 [38]. London, 1755.

Esper, Eugenius Johann Christoph. *Die Pflanzenthiere in Abbildungen nach der Natur mit Farben erleuchtet nebst Beschreibungen* **1–3:** i–xii + 1–320; 1–220; 1–285+; *Fortsetzung* **1–2:** 1–230; 1–48, 428 pls. Nürnberg-1788–1850. [The parts dealing with gorgonians were published as follows: Vol. 2, pp; 1–96, 1791; pp. 97–180, 1792; pp. 181–220, 1793. pp. 221–304, 1799; Fortsetzung, vol. 1, pp. 117–168, 1796; pp. 169–230, 1797.]

Galtsoff, Paul Simon. *The pearl oyster resources of Panama.* U. S. Fish and Wildlife Service Special Scientific Report: Fisheries no. 28: 1–53, 28 figs. 1950.

Horn, George. *Descriptions of three new species of Gorgonidae, in the collection of the Academy,* Proc. Acad. Nat. Sci. Philadelphia **12:** 233. 1860.

Kükenthal, Willy. *Die Gorgonarien Westindiens. Kap. 2, Über den Venusfächer; Kap. 3, Die Gattung* Xiphigorgia *H. M. Edw.* Zool. Jahrb., Suppl. 11, Heft 4: 485–503, 13 figs., pl. 23. 1916.

———. *Gorgonaria.* Wissenschaftliche Ergebnisse der deutschen Tiefsee-Expedition auf dem Dampfer *Valdivia* 1898–99, **13** (2): 1–946, 318 figs., pls. 30–89. 1919.

———. *Gorgonaria.* Das Tierreich **47:** i–xxviii + 1–478, 209 figs. 1924.

Linné, Karl von. *Systema naturae,* ed. 10, **1:** [2] 1–824. Holmiae, 1758.

Lochner von Hummelstein, Johann Heinrich. *Rariora musei Besleriani quae olim Basilius et Michael Rupertus Besleri collegerunt:* [12] 1–112, pls. 1–40. Norimbergae, 1716.

Milne Edwards, Henri, and Haime, Jules. *A monograph of the British fossil corals. Part 1. Introduction; corals from the Tertiary and Cretaceous formations:* i–lxxxv + 1–71, pls. 1–11. London, 1850.

———. *Histoire naturelle des coralliaires ou polypes proprement dits:* 1–3, pp. i–xxxjv + 1–326; 1–633; 1–560; atlas of 36 pls. Paris, 1857.

Olearius, Adam. *Gottorfische Kunst-Kammer:* [5 lvs.] 1–80, pls. 1–37. Schlesswig, 1674.

Pallas, Peter Simon. *Elenchus zoophytorum sistens generum adumbrationes generaliores et specierum cognitarum succinctas descriptiones cum selectis auctorum synonymis:* i–xvi + 1–451. Hagae-Comitum, 1766.

Sloane, Hans. *A voyage to the islands Madera, Barbados, Nieves, S. Christophers and Ja-*

maica, with the natural history of the herbs and trees, four footed beasts, fishes, birds, insects, reptiles & c. of the last of those islands . . . **1:** [7 lvs] i–cliv + 1–264, pls [4] 1–156. London, 1707.

STIASNY, GUSTAV. *Gorgonaria von Panama.* Vidensk. Medd. Dansk naturh. Foren. **107:** 59–103, figs. 1–16. 1943.

VALENCIENNES, ACHILLE. *In* A. Dupetit-Thouars, *Voyage autour du monde sur la frégate la Vénus, pendant les années 1836–1839.* Atlas de Zoologie: Zoophytes: pls. 1–15. Paris, 1846.

———. *Extrait d'une monographie de la famille des Gorgonidées de la classe des polypes.* Comptes Rendus Séances Acad. Sci. Paris **41:** 7–15. 1855.

VERRILL, ADDISON EMERY. *List of the polyps and corals sent by the Museum of Comparative Zoölogy to other institutions in exchange, with annotations.* Bull. Mus. Comp. Zool. **1:** 29–60. 1864.

———. *Review of the corals and polyps of the west coast of America.* Trans. Conn. Acad. Arts and Sciences **1:** 377–567, pls. 5–10. 1868–71. [Actual dates of publications are: pp. 377–390, April 1868; pp. 391–398, June 1868; pp. 399–414, July 1868; pp. 415–422, December 1868; pp. 423–454, January 1869; pp. 455–478, February 1689; pp. 479–502, March 1869; pp. 503–518, April 1870; pp. 519–534, Nov. 1870; p. 567, February 1871.]

———. *Critical remarks on halcyonoid polyps in the museum of Yale College, with descriptions of new genera.* Amer. Journ. Sci. **45:** 411–415. 1868.

———. *Critical remarks on halcyonoid polyps, no. 3.* Amer. Journ. Sci. **48:** 419–429. 1869.

———. *The gorgonians of the Brazilian coast.* Journ. Acad. Nat. Sci. Philadelphia (2) **15:** 373–404, 1 fig., pls. 29–35. 1912.

MALACOLOGY.—*Recent species of the veneroid pelecypod* Arctica.[1] DAVID NICOL, U. S. National Museum.

The study represented by this paper is the third in a series on living relict pelecypods. In comparison with *Fimbria* and *Cucullaea*, the living species of *Arctica* is well known, and many good studies have been made on it in several northern Atlantic regions. The shellfish surveys of Rhode Island and Massachusetts have recently obtained valuable information on the ecology of the genus, and it is possible that *Arctica* will soon assume commercial importance as an edible clam. There have, however, been few attempts to make a complete study of the living species. The latest review of *Arctica* is that of Lamy (1920, pp. 260–265).

Arctica, first appearing in the early Cretaceous, has apparently always been confined to temperate waters. Since the Cenozoic the genus has been confined to Europe and the north Atlantic regions. At present there is one living species, confined primarily to the north Atlantic.

Arctica has been placed in many different superfamilies. On the basis of shell characters *Arctica* most closely resembles some of the brackish water genera, as for example *Batissa*. Among the living marine pelecypods *Arctica* resembles the veneraceans. The lack of a pallial sinus and the development of posterior lateral teeth are morphologic characters present in *Arctica* but not in the veneraceans.

Family ARCTICIDAE Newton, 1891

Genus **Arctica** Schumacher, 1817

Venus Linné, 1767 (in part).
Pectunculus da Costa, 1778 (in part).
Cyclas Link, 1807, not *Cyclas* Bruguière, 1798.
Cyprina Lamarck, 1818.
Armida Gistel, 1848, not *Armida* Risso, 1826.
Cypriniadca Rovereto, 1900.

Genotype: *Arctica vulgaris* Schumacher, 1817 = *Venus islandica* Linné, 1767 (monotypy).

In 1752 Moehring used the name *Arctica* for a genus of birds, but this work and the translation published in 1758 have been suppressed (see opinion 5, vol. 1, pt. 14, 1944, pp. 115–126). Schumacher's genus name *Arctica*, published in 1817, can thus be used. Lamarck applied the French vernacular term Cyprine in 1812 but did not use the name *Cyprina* until 1818.

Arctica islandica (Linné), 1767

Figs. 1–3

1767. *Venus islondica* Linné, Syst. Nat., ed. 12, **1** (pt. 2): 1131.
1777. *Venus mercenaria* Linné, Pennant, British zoology **4**, Mollusca: 94, pl. 53, fig. 47.
1778. *Pectunculus crassus* da Costa, British conchology: 183, 184, pl. 14, fig. 5.

[1] Published by permission of the Secretary of the Smithsonian Institution.